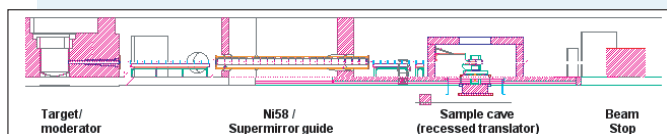


Spectrometer for Materials Research at Temperature and Stress (SMARTS)

The Spectrometer for Materials Research at Temperature and Stress (SMARTS) instrument, due online summer 2001, will be a third-generation neutron diffractometer dedicated to structural materials studies. Based on conservative performance estimates, it will dramatically expand LANSCE capabilities into areas of research not currently possible by increasing the maximum attainable temperatures and stresses, separately and in combination, and by reducing sampling volumes used in spatially resolved work. Principal goals for SMARTS include 1-mm³ sampling volumes for spatially resolved strain and texture profiles within components, *in situ* uniaxial loading on samples up to 1 cm in diameter to in excess of 2 GPa at temperatures up to 1800°C, and *in situ* reaction or phase-transformation studies at temperatures up to 2000°C. The space in the spectrometer will allow components of dimensions up to or greater than 1 m and masses up to 1,500 kg to be mounted in the beam. Another critical feature of the SMARTS design is the ability to permanently mount alignment telescopes several meters from the specimen position. This feature will provide a simple and efficient way to line up samples or equipment in the beam to within 0.01-mm accuracy. SMARTS also provides an efficient compromise between the needs of high intensity for spatially resolved work and high resolution for resolving the performance of individual hkl reflections, necessary for testing models of polycrystalline deformation or for strain deconvolution.

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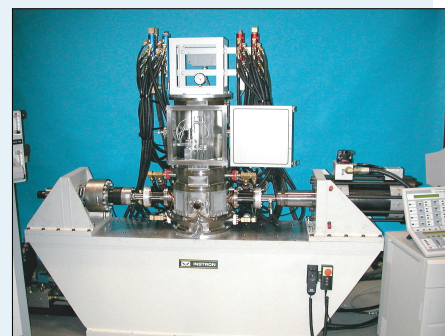
▲ The SMARTS spectrometer being installed at the Lujan Center will dramatically improve the country's capability in neutron-scattering studies of advanced materials.

A technician from the French corporation CILAS installs the SMARTS beam guide.

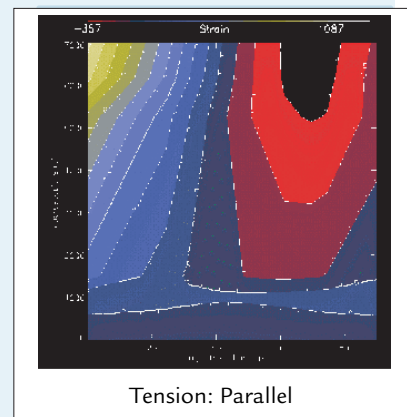


SMARTS Specifications

Performance	
Moderator	Chilled H ₂ O, high resolution
Resolution at 90° (wavelength dependent)	~ 0.4%
d-spacing range	~ 0.5 - 4 Å
Nominal time for 1 cm ³ under load at temperature	~ 10 minutes
Nominal time for 1 mm ³ in 10-mm-thick Fe plate	~ 60 minutes
Primary Flight Path	
Moderator to sample	~ 31.0 m
Incident collimation (at sample)	1 mm ² , - 1 cm ²
Secondary Flight Path	
Sample to 90° tube	~ 1.5 m
2θ angle subtended (each 90° bank)	~ 30°
Load Frame Furnace	
Maximum uniaxial force (compression or tension)	250 kN
Actuator motion	0.15 m
Furnace maximum temperature - under load	1500°C
Furnace maximum temperature - stand alone	1800°C
Specimen geometries	Threaded tensile/Cylinder compression
Translator	
Capacity	1500 kg
Motions	X = 0.3 m, Y = 0.3 m, Z = 0.6 m, R = 370°
Radial Collimators	
2θ angle subtended	20°
Spatial resolution parallel to beam	1, 2, 3, 4, 5 mm



▲ The SMARTS load-frame-furnace suite offers *in situ* neutron diffraction at loads up to 250 kN and temperatures up to 1800°C.



▲ Typical data produced by *in situ* deformation tests will identify the development of intergranular strain.